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Methods"; and U.S. Patent Application Serial No. 10/074,591, Attorney Docket No. SILA:096, titled "Apparatus for Generating Multiple Radio Frequencies in Communication Circuitry and Associated Methods."

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In the Claims:

Please amend claim 1, cancel claim 2 and add new claims 3-36.

The rewritten clean versions of all the pending claims are provided below. Attached at the end of this paper is an Appendix providing an indication of the changes relative to the prior version of the claims, as now required by Rule 121(c).

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1. A radio-frequency (RF) apparatus capable of transmitting radio-frequency signals, the radio-frequency apparatus comprising:

transmitter path circuitry, including:

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a voltage-controlled oscillator circuitry, the voltage-controlled oscillator circuitry configured to generate an output signal having an adjustable frequency in response to first and second control signals ;

a first feedback circuitry, the first feedback circuitry being responsive to the output signal of the voltage-controlled oscillator circuitry, the first feedback circuitry configured to provide the first control signal to the voltage-controlled oscillator circuitry; and

a second feedback circuitry, the second feedback circuitry being responsive to the output signal of the voltage-controlled oscillator circuitry, the second feedback circuitry configured to provide the second control signal to the voltage-controlled oscillator circuitry,

wherein the first control signal coarsely adjusts the frequency of the output signal of the voltage-controlled oscillator circuitry to a desired frequency, and

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wherein the second control signal fine tunes the frequency of the output signal of the voltage-controlled oscillator circuitry to the desired frequency.

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3. The radio-frequency (RF) apparatus according to claim 1, wherein the frequency of the output signal of the voltage-controlled oscillator is adjusted during a first adjustment phase, and wherein the frequency of the output signal of the voltage-controlled oscillator is fine tuned during a second adjustment phase.

4. The radio-frequency (RF) apparatus according to claim 3, wherein the first adjustment phase occurs before the second adjustment phase.

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5. The radio-frequency (RF) apparatus according to claim 4, wherein the first feedback circuitry adjusts the frequency of the output signal of the voltage-controlled oscillator during the first adjustment phase, and wherein the second feedback circuitry adjusts the frequency of the output signal of the voltage-controlled oscillator during the second adjustment phase.

6. The radio-frequency (RF) apparatus according to claim 5, wherein the first control signal comprises a plurality of digital signals.

7. The radio-frequency (RF) apparatus according to claim 6, wherein the second control signal comprises an analog signal.

8. The radio-frequency (RF) apparatus according to claim 7, wherein the second adjustment phase commences in response to a signal provided to the second feedback circuitry by the first feedback circuitry.

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9. The radio-frequency (RF) apparatus according to claim 8, wherein the first adjustment phase and the second adjustment phase occur before a transmit burst by the transmitter path circuitry.
  10. The radio-frequency (RF) apparatus according to claim 9, wherein the first feedback circuitry is further responsive to a reference signal.
  11. The radio-frequency (RF) apparatus according to claim 10, wherein the second feedback circuitry is further responsive to an intermediate-frequency signal.
  12. The radio-frequency (RF) apparatus according to claim 11, wherein the second feedback circuitry is further responsive to a radio-frequency local oscillator signal.
  13. An integrated circuit, comprising:
    - a voltage-controlled oscillator circuit coupled to a radio-frequency transmitter circuit within the integrated circuit, the voltage-controlled oscillator circuit including:
      - a continuously variable capacitor having a plurality of capacitor stages, the continuously variable capacitor having a capacitance that varies in response to an analog control signal; and
      - a discretely variable capacitor coupled in parallel with the continuously variable capacitor, the discretely variable capacitor having a capacitance that varies in response to a plurality of control signals; and
    - a feedback circuit coupled to the voltage-controlled oscillator circuit, the feedback circuit configured to supply the analog control signal and the plurality of control signals in response to an output signal of the voltage-controlled oscillator circuit,

wherein the radio-frequency transmitter circuit has an output signal derived from the output signal of the voltage-controlled oscillator circuit.

14. The integrated circuit according to claim 13, wherein the continuously variable capacitor comprises a plurality of variable capacitors coupled in parallel.

15. The integrated circuit according to claim 14, wherein a capacitance of each variable capacitor in the continuously variable capacitor varies in response to a plurality of signals derived from the analog control signal.

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16. The integrated circuit according to claim 15, wherein the discretely variable capacitor comprises a plurality of capacitor-switch combinations coupled in parallel, wherein each of the plurality of capacitor-switch combinations comprises a capacitor coupled in parallel with a switch.

17. The integrated circuit according to claim 16, wherein each of the plurality of control signals controls a corresponding one of the switches in the plurality of capacitor-switch combinations.

18. The integrated circuit according to claim 17, wherein the feedback circuit comprises a first feedback circuit and a second feedback circuit.

19. The integrated circuit according to claim 18, wherein the first feedback circuit comprises a frequency calibration engine configured to supply the plurality of control signals.

20. The integrated circuit according to claim 19, wherein the frequency calibration engine supplies the plurality of control signals in response to a reference signal and the output signal of the voltage-controlled oscillator circuit.

21. The integrated circuit according to claim 20, wherein the second feedback circuit comprises a mixer, the mixer configured to provide a mixed signal derived from the output signal of the voltage-controlled oscillator circuit and a radio-frequency local oscillator signal.

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22. The integrated circuit according to claim 21, wherein the second feedback circuit further comprises a phase detector circuit, the phase detector circuit configured to provide an error signal derived from the mixed signal and an intermediate-frequency signal.

23. The integrated circuit according to claim 22, wherein the second feedback circuit further comprises a filter circuit, the filter circuit configured to supply the analog control signal in response to the error signal.

24. The integrated circuit according to claim 23, further comprising receiver circuitry configured to receive a radio-frequency input signal.

25. The integrated circuit according to claim 24, wherein the receiver circuitry couples to signal processing circuitry within a second integrated circuit.

26. The integrated circuit according to claim 25, wherein the receiver circuitry comprises low intermediate-frequency receiver circuitry.

27. A method of generating radio-frequency (RF) signals in an apparatus capable of transmitting radio-frequency signals, comprising:

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generating with a controlled oscillator circuitry an output signal having a  
frequency that is adjustable in response to first and second control signals;  
generating the first control signal in response to the output signal of the controlled  
oscillator circuitry;  
adjusting coarsely the frequency of the output signal of the controlled oscillator  
circuitry to a desired frequency in response to the first control signal;  
generating the second control signal in response to the output signal of the  
controlled oscillator circuitry; and  
fine tuning the frequency of the output signal of the controlled oscillator circuitry  
to the desired frequency in response to the second control signal.

28. The method according to claim 27, further comprising:  
adjusting the frequency of the output signal of the controlled oscillator during a  
first adjustment phase; and  
fine tuning the frequency of the output signal of the controlled oscillator circuitry  
during a second adjustment phase.
29. The method according to claim 28, further comprising performing the first  
adjustment phase before the second adjustment phase.
30. The method according to claim 29, further comprising:  
using the first control signal to adjust coarsely the frequency of the output signal  
of the controlled oscillator circuitry during the first adjustment phase; and  
using the second control signal to fine tune the frequency of the output signal of  
the controlled oscillator during the second adjustment phase.
31. The method according to claim 30, wherein the first control signal comprises a  
plurality of digital signals.

32. The method according to claim 31, wherein the second control signal comprises an analog signal.

33. The method according to claim 32, further comprising:  
performing the first adjustment phase;  
performing the second adjustment phase; and  
starting a transmit burst.

34. The method according to claim 33, wherein generating the first control signal further comprises using a reference signal to derive the first control signal.

35. The method according to claim 34, wherein generating the second control signal further comprises using a radio-frequency local oscillator signal to derive the second control signal.

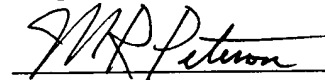
36. The method according to claim 35, wherein generating the second control signal further comprises using an intermediate-frequency signal to derive the second control.

**CONCLUSION**

With this amendment, claims 1 and 3-36 are pending. Claim 2 has been cancelled. A check in the amount of \$270 is enclosed for the addition of 15 dependent claims and 1 independent claim.

Should any fees under 37 CFR 1.16-1.21 be required for any reason relating to the enclosed materials, the Commissioner is authorized to deduct such fees from Deposit Account No. 10-1205/SILA:075. The examiner is invited to contact the undersigned at the phone number indicated below with any questions or comments, or to otherwise facilitate expeditious and compact prosecution of the application.

Respectfully submitted,



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